Lagopus FPGA - a reprogrammable data plane for high-performance software SDN switches

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Innovative R&D by NTT

1. What is SDN* and why?

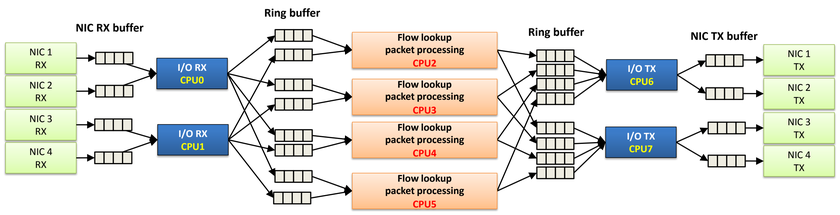
- Innovate network services and applications in software development speed
- Decouple network control and forwarding functions
- OpenFlow is a foundational protocol for building SDN

2. What is Lagopus vSwitch?

- The best OpenFlow 1.3 compliant software switch
- High-performance packet processing over 10Gbps
- Elastic network flow control for 1M flow entries
- Works on commodity IA server and NIC
- Scalable flow dispatcher for NFV* applications

Open source software download: http://lagopus.github.io/

3. Packet processing on multi-core CPUs



- Explicit thread assignment to CPU core
- Decouple I/O processing and flow processing

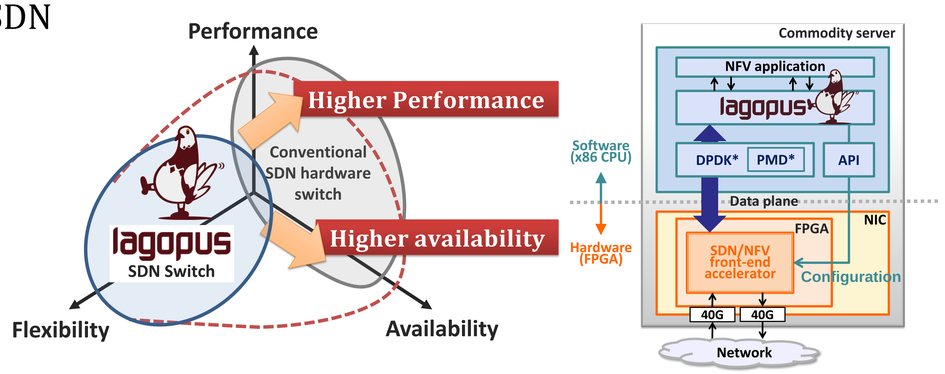
4. Issues of CPU centralized processing

- No offloading functions w/ general purpose NIC
- Cannot fully utilize multi-core CPU power

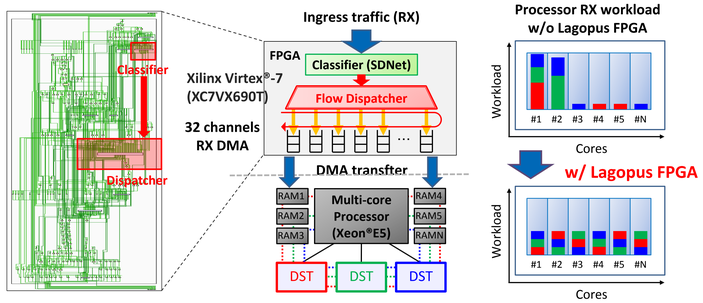
Our approach: optimize high-performance, elastic software data plane with CPU + FPGA architecture

5. Designing concept and architecture

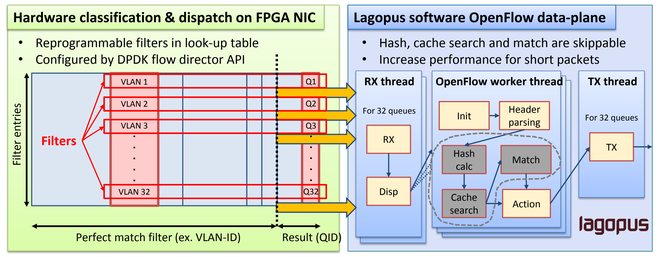
- Provide high-performance and advance features
- Hardware acceralation for NFV applications
- Ensuring flexible control and management



6. FPGA flow classification & dispatch empowered by SDNet and flow director

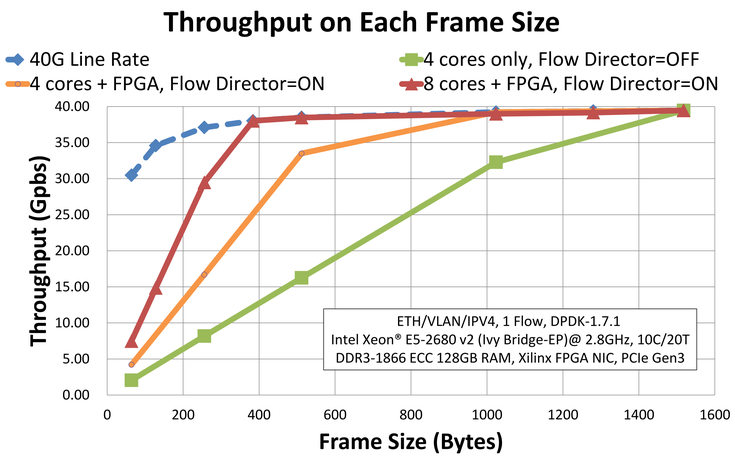


256-bit@250MHz FPGA data path parallelly forwards packets to x86 via DMA



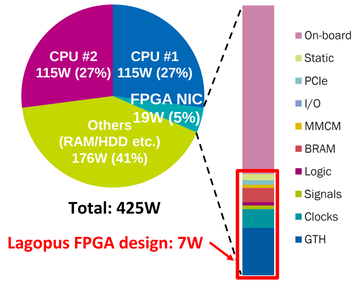
- Preprocessing match filter by DPDK* flow director
- Accelerating high-intensity data plane operations

7. Performance vs. Power Dissipation

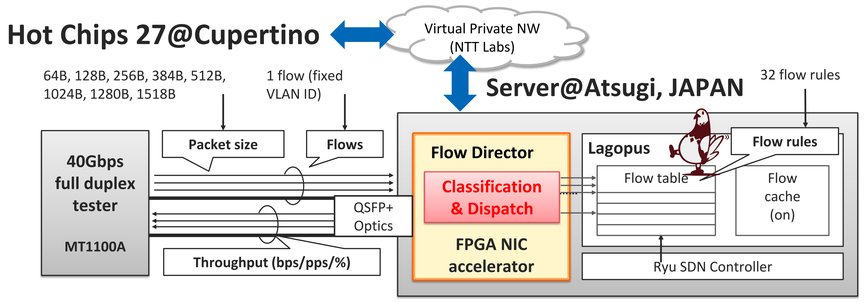


Wattage of wire-speed transmission

Enhancing performance to 40Gbps with less than 10% x86 CPU power dissipation



8. Demonstration



9. Conclusion and future work

- To accelerate carrier NFV applications
- To explore 100-Gbps-capable software packet processing-awre architecture

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*SDN: Software-Defined Networking *NFV: Network Functions Virtualization *DPDK: Data Plane Development Kit *PMD: Poll Mode Driver